On the web at www.bedfordbasin.ca

BIO-OCEANS ASSOCIATION NEWSLETTER

Issue 40, October 2008

CONTENTS

FROM THE PRESIDENT

It has been a busy summer for the Association and BIO with lots of activities and events since the last newsletter. We kicked off the summer with a great picnic at Shiri Srivastava's on 4 September. The weather cooperated and it was well attended – not surprising given the amazing food and hospitality that Shiri provided. A huge thanks from the Association, Shiri! The efforts of Gordon Fader and Georgina Phillips in organizing the event also have to be recognized.

On 22-26 September was the Annual Science Conference of the International Council for the Exploration of the Sea (ICES). No, we didn't put this on, but BIO was the host institute for this year's meeting which brought together about 600 ocean scientists from around the globe. Many scientists from BIO and the Association were involved, and word on the street is that everyone really enjoyed the conference and the city. I heard that much science got discussed in places like the Economy Shoe Shop!

The new North Wing Laboratory building at BIO was officially opened on 15 October 2008. The building was named after Kathy Ellis, whom many of you knew. John Smith gave a really great overview of her research from 1978 – 1999 at BIO . It was a truly fitting event for a wonderful colleague and scientist.

As the Kathy Ellis Building was being opened, the St. Andrew's Biological Station was holding its 100th Anniversary celebrations. The Station is the oldest marine institute in Canada and a series of events and activities were held over four days: 15 – 18 October. Bob Cook attended and provides a report in this issue (p.5).

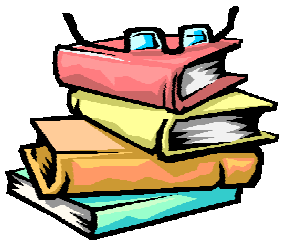
And there are lots of upcoming activities that you should note. On 26 November, Dale Buckley will be giving a lecture in the main auditorium at BIO on the history of the Institute. Dale has compiled this history as part of the Association's Commemorative Stamp project. He provides a synopsis of the Institute's accomplishments in this newsletter. I really encourage all of you to come out and attend his talk. The intent is that once he finishes his presentation, members can share their experiences with the audience and indeed add to the history that Dale is compiling.

On 27 November, BIO will be hosting the Annual Huntsman Awards Ceremony. This starts at 2:00 p.m. in the Main Auditorium. This year's winner is Dr. Roger François of University of British Columbia for his groundbreaking research and leadership in marine geochemistry. Clive Mason recently sent out a request for volunteers to help out, so if you can, that would be great. At the BIO Association's last Executive meeting on 22 October, collaboration between our two associations was discussed with Huntsman Committee President Alain Vezina. You will be hearing more about this in future newsletters.

Finally, watch for announcements of the BIO Christmas party, which I believe is scheduled for 5 December (to be confirmed). It's always a good time!

On a sadder note, some of our colleagues have passed away recently including George Anderson, a very active contributor to our Association, as well as a number of others. Brief obituary notices are included elsewhere in this issue. Our thoughts go out to their families.

— Bob O'Boyle



Noteworthy Reads: Book Reviews in Brief

David N. Nettleship
Book Review Editor

The ***Noteworthy Reads*** section is an effort by BIO-OA to produce a representative list of recent noteworthy book publications related to the marine sciences and other subjects of general interest. The listing is not intended to be comprehensive or complete, but merely an attempt to highlight a number of 'good reads' that may be of interest to OA members and associates. Most books listed are available at local bookstores and public libraries. Book prices are regular retail in Canadian funds, but discounts of 20-30% are normally available on line at: e.g., amazon.ca or chapters.indigo.ca. Contributions of book reviews to 'Noteworthy Reads' are welcome – send via e-mail to David Nettleship: dnnlundy@navnet.net (phone: 902-826-2360).

Special Publication:

Limits to Fish Farming

Molyneaux, Paul. 2007. Swimming in Circles: Aquaculture and the End of Wild Oceans. Thunder's Mouth Press (Avalon Publishing Group), New York, NY. 344 pp. Softcover, $19.95 (ISBN 9781560257561). – This work by longtime fisherman and investigative reporter Paul Molyneaux, presents a disturbing overview of fish farming and its adverse effects on the marine environment and wild fish populations. His review focuses on salmon and shrimp farms, especially those in Maine and Mexico, and his findings support the view that rather than compensating for the world's diminished fish supply from overfishing, aquaculture developments actually deplete ocean resources and contaminate marine waters and ecosystems. Examples are given of how farmed fish suffer from diseases with the antibiotics used to treat them spreading through the food chain causing irreparable harm, how pesticides applied by fish farmers contaminate the waters, how wild fish are used to feed farmed fish which further depletes wild fish stocks, and how farmed fish escape from net cages and interbreed with wild fish causing genetic pollution. Molyneaux's analysis presents a powerful case against aquaculture, or at least erases the belief that fish farming is the solution to the collapse of wild fisheries worldwide, and a demand for governments and the fishing industry to take immediate action in wild stock preservation and protection. A wake-up call for everyone! [also see below, Anderson 2007]

General Reviews

Anderson, John M. 2007. The Salmon Connection: The Development of Atlantic Aquaculture in Canada. Glen Margaret Publishing, Tantallon, NS. 166 pp. Softcover, $19.95 (ISBN 9781897462010). -- John Anderson is a salmon biologist with a distinguished career including serving as Director of the St. Andrews Biological Station, President of the University of New Brunswick, and the first President of the Aquaculture Association of Canada. Through his enduring interest in the Atlantic salmon and long standing scientific affiliation with the Atlantic Salmon Federation, he presents an easy to read history of the culture of Atlantic salmon starting with the early federal hatcheries used for enhancement in the 1860s, to the critical biological research in the 1960s and the critical field trial in 1978-79 that demonstrated that Atlantic salmon could successfully survive in sea cages over winter in the Bay of Fundy. From that point on, Atlantic salmon aquaculture developed rapidly on both the Atlantic and Pacific coasts. The author provides an insightful description on some of the people involved and the technological advances that were made as salmon farming took hold in Canada and became a viable economic reality. Comments are also provided on the problem areas as well such as the interactions with the environment and the traditional fisheries, and coping with diseases and parasites. The impact of escaped farmed Atlantic salmon on wild populations is another issue of note. "The Salmon Connection" provides the reader with an informed insight into the use and economic development of one of Atlantic Canada's most famous natural resources, the Atlantic salmon. (Robert H. Cook) [also see above, Molyneaux 2007]

Bryant, Mary Harrington. 2007. 4 Years – and Then Some. Pro Printers, Ottawa, ON. 297 pp. Softcover, $25.00 (ISBN 9780973337211; available from the author: 447 Thessaly Circle, Ottawa, ON K1H 5W7). – Here is a compelling chronicle of a young Saskatchewan school teacher, Mary (Harrington) Bryant, who travelled six weeks northward by paddle wheeler into the western Canadian arctic in 1944 to reach Aklavik, Northwest Territories, to become the first federal residential school teacher for the native people in the delta region of the great MacKenzie River. She went on to help build the first day school in Tuktoyaktuk, and worked with Inuit, Loucheux (Kutchin) and community children until 1948 when she returned south. The story is gripping, revealing the formidable nature of the task and the amazing ingenuity and skills used by Mary Bryant and her co-workers to succeed in establishing the school and becoming a vibrant part of

the community. Her return to Aklavik in 1955, in a new role as wife and mother with husband Joe Bryant, a Canadian Wildlife Service biologist, allowed her to observe and assess the major changes that had taken place in the way of life of the people, particularly those associated with government administration, the schools and the village. This book not only gives the personal experiences of the challenge of northern living at the time, but provides a rare and important insight into the culture of the Delta people in the 1940s and the rapid changes that occurred through the 1950s. Anyone with an interest in northern Canada and its peoples will benefit greatly by reading this book.

Calvin, William H. 2008. Global Fever: How to Treat Climate Change. University of Chicago Press, Chicago, IL. 352 pp. Hardcover, $22.95 (ISBN 9780226092041). – Here is a book on climate change that provides both the diagnosis of the nature and root causes of the problem, and solutions for a cure. William Calvin, outstanding scientist and author of 14 science books including "A Brain for All Seasons: Human Evolution and Climate Change", first gives a straightforward summary of the current state of the Earth's warming climate and the reasons for it, followed by a clear warning of what will likely take place in the future if increasing temperatures continue. He then argues that today's global warning can be controlled and reduced through aggressive action by the world community and its governments to develop low-emission technologies that will ultimately produce a clean industrial environment. Not to do so will result in resource depletion, drought and disease, leading to socio-economic upheaval worldwide. Overall, Calvin's well written book, based on the latest climate science, is a call for urgent action to safeguard the future of the planet.

Darby, Andrew. 2008. Harpoon: Into the Heart of Whaling. A Merloyd Lawrence Book, Lifelong Books, Da Capo Press, Cambridge, MA. 300 pp. Hardcover, $26.95 (ISBN 9780306816291). – This definitive work by journalist Andrew Darby, who has covered the whaling industry and associated international politics since the inception of the International Whaling Commission in the 1960s, profiles whales by describing each type and its place in the dramatic drama/tragedy of whaling. A short history of hunting whales in the 19th century and earlier is provided, but the bulk of the work is focused on the 20th century industrial whaling boom and its technological advances in the hunting and killing of whales including the current high-tech methods of the "scientific" factory-ship whalers. International efforts to curb whaling are also reviewed, as are the diplomatic maneuvers by rogue governments determined to see the killing of whales continue (Iceland, Japan, Norway, and Russia). Darby's book is important both as an unbiased chronicle of the relentless and successful pursuit of whales by man and as a warning of the vulnerability of these majestic mammals to extinction from human predation.

Ellis, Richard. 2008. Tuna: A Love Story. Alfred A. Knopf, New York, NY. 338 pp. Hardcover, $33.00 (ISBN 9780307267153). – This is a personal and impassioned plea to protect and save one of the deep ocean's most regal creatures by a celebrated authority on marine biology and ocean systems. Richard Ellis is North America's foremost contemporary ocean chronicler with previous outstanding works including "Aquagenesis: the Origin and Evolution of Life in the Sea", "The Search for the Giant Squid", "The Empty Ocean: Plundering the World's Marine Life", and "Encyclopedia of the Sea". The present work -- extensively researched, magnificently and carefully written, and beautifully illustrated – delivers a most convincing call for action to save the endangered Northern Bluefin Tuna, now hovering on the brink of extinction owing to overfishing and "tuna farming/tuna ranches" for the lucrative and insatiable sushi market, especially in Japan. The book's impact on any reader with a feel for ocean waters and their future will be overwhelming.

Girling, Richard. 2007. Sea Change: Britain's Coastal Catastrophe. Eden Project Books (Transworld Publishing), London, UK. 368 pp. Hardcover, $42.50 (ISBN 9781903919774). – In this timely volume on the relationship between Britons and their marine coastlines, Richard Girling, a senior feature writer for "The Sunday Times of London Magazine", presents a devastating attack on government decision-makers responsible for the management and protection of the marine environment. Well researched and with carefully documented facts, Girling reveals gross incompetence and political weakness in responding to the major changes that have taken place recently in the health of Britain's coastal waters and marine ecosystems. He details the extent of erosion that has occurred from oil pollution, toxic chemicals, overfishing, and human-induced climate change, and the failure of the government to recognize the existing crisis. His is a call for immediate action to prevent the destruction of the marine environment. It would be wise for all of us to heed the warning and force those who are meant to be in charge of the welfare of our coastal seas to act before it is too late. This book should be read by everyone!

Hooper, Meredith. 2008. The Ferocious Summer: Adélie Penguins and the Warming of Antarctica. Greystone Books, Vancouver, BC. 300 pp. Hardcover, $29.95 (ISBN 9781553653691). – Meredith Hooper, award-winning au-

thor and expert on Antarctica, provides an eye-opening first-hand account on the devastating impact of rapid global warming on the biota and ecosystems of the Antarctic Peninsula. From spending a summer with scientists studying the breeding population of Adélie Penguins at Palmer Station and reviewing their research findings collected over the past 15 years, Hooper summarizes how increases in temperature, six times faster than the average rate recorded elsewhere, have contributed to the recorded reproductive failure of the penguins. At the top of the food chain, penguins and other top-trophic feeders serve as sensitive biological indicators of the state of our seas. This story, based on carefully executed long-term scientific studies, presents an alarming warning to all of us of the catastrophic impact that global warming can have on living systems and the health of the planet. Overall, a timely book that must be read with its important message digested and acted upon.

Simpson, Jeffrey, Mark Jaccard and Nic Rivers. 2007. Hot Air: Meeting Canada's Climate Change Challenge. McClelland & Stewart (Douglas Gibson Books), Toronto, ON. 280 pp. Hardcover, $29.99 (ISBN 9780771080968). – This timely book, hopefully read by both our political leaders and other Canadians, may influence the direction that parties and voters take in the upcoming federal election scheduled for 14 October 2008. Here is a clear and important assessment about greenhouse gas (GHG) emissions in Canada and how they can be reduced. Mark Jaccard, award-winning environmental scientist, and fellow researcher Nic Rivers, both at Simon Fraser University, recruited highly-respected Globe and Mail columnist Jeffrey Simpson to form a team to produce a unique overview of climate change and the threat it poses to Canada. And what a job they have done, beyond anything done previously on the energy and climate change question! The authors start with a succinct review of Canada's climate change and its devastating consequences both now and in the future, followed by damning indictments of politicians (by pretending to be concerned), industrialists (by pretending the problem doesn't exist), and environmentalists (by offering simplistic solutions). In chapter seven, entitled "What We Should Do", the authors provide an easily understood "green plan" based on a few straightforward policies already underway in other countries that will significantly reduce GHG emissions. Canadians must force their governments to cease wasting time and taxpayers' monies on cosmetic "eco projects" and address the root cause of climate change: i.e., the free-dumping of GHG emissions into the atmosphere. "Hot Air" shows us how to stop pursuing failed policies, and get on with initiatives that we know will work.

Smith, Ken. 2008. A History of Disaster: The Worst Storms, Accidents and Conflagrations in Atlantic Canada. Nimbus Publishing, Halifax, NS. 224 pp. Softcover, $21.95 (ISBN 9781551096513). -- Ken Smith, retired mining technician and local historian, has made a significant contribution to our knowledge of Atlantic Canada by identifying and summarizing 43 major disasters that have occurred in the region over the past 250 years. Organized chronologically and grouped according to type of disaster – weather, ships lost at sea, fire, explosions, mining, sealing, and air crashes – the events profiled reveal the constant threat of disaster faced by people. Livelihoods associated with unpredictable seas and volatile mines such as those in Atlantic Canada, past and present, always place people at risk. The 43 different catastrophes selected by Smith reveal clearly the extent of destruction, heartbreak, and bravery that can come with unexpected events. Many of these deadly disasters are well known – Titanic sinking (1912), the Halifax Explosion (1917), Ocean Ranger (1982), Westray mine collapse (1992), Swissair 111 (1999), Hurricane Juan (2003) – but many are not such as the Burin Peninsula tsunami (1929), Saxby Gale, and the disastrous fires in Miramichi (1825) and Saint John (1877). In total, this work of history reminds the reader of the tumultuous history of the region and the diversity of causes of disasters that have occurred from both natural and human-induced activity.

NOTED BIO SCIENTIST STEPHEN ROY KERR DIES

Don Gordon

Dr. Stephen Kerr was a top-notch fisheries ecologist who made many contributions to both BIO and Canadian fisheries science. He joined the Marine Ecology Laboratory in 1970 and initially worked on the problem of chlorinated hydrocarbons in marine food webs. He later worked extensively on predator-prey theory of aquatic production. Along with Dr. Lloyd Dickie, he authored a book summarizing research on the biomass spectrum published by Columbia University Press. For several years, he was the Head of the Fisheries Oceanography Division. He also played a major role in the Ocean Production Enhancement Network (OPEN) program that was conducted cooperatively by government and university laboratories, in particular conducting research on the genetic properties of different populations of Atlantic cod. He was a highly respected scientist who published widely and supervised numerous graduate students. His lifetime achievements constitute an outstanding contribution to Canadian fisheries ecology.

ST. ANDREWS BIOLOGICAL STATION CELEBRATES ITS 100TH ANNIVERSARY

Robert H. Cook

Canada's first permanent marine biology research institute on the Atlantic was established in St. Andrews, New Brunswick, in 1908. On the Pacific, the Biological Station at Nanaimo, British Columbia, was also established in that year. To celebrate, St. Andrews Biological Station (SABS) hosted a two-day workshop entitled "The Evolution of Marine Science in Canada", held at the Algonquin Hotel in St. Andrews, 15-16 October 2008, as part of the centenary activities. Excellent poster and audiovisual displays portrayed the major research events from the St. Andrews Station over this 100-year period.

Rob Stephenson, the current Station Director, served as the Workshop moderator. Speakers included Mike Sinclair on the Canadian Fisheries Expedition of Hjort and Huntsman in the 1915's and Mary Arai, the daughter of Alfred Needler, a former Station Director and Deputy Minister, and sister of BIO's George Needler, who spoke on the history of contributions by women in the marine sciences. Bob Cook, former Station Director, and member of the BIO-Oceans Association, provided a paper on the historic role of SABS in aquaculture research and development. In all, 18 presentations were made at the workshop. The workshop closed with a "Director's Panel", moderated by Rob Stevenson and consisting of five previous Station Directors: John Anderson (1967-72), Ralph Brinkhurst (1972-75), Bob Cook (1977-1992), Wendy Watson-Wright (1992-1997), and Tom Sephton (1997-2005). Each was asked to comment on their respective successes, frustrations, and significant events that occurred during their tenure, and for their vision of the future at SABS.

The entire Workshop was videotaped. Abstracts of the talks presented at the Workshop are planned to be published as a proceedings, with some of the papers possibly developed further for inclusion in a special edition of the *Canadian Journal of Fisheries and Aquatic Sciences*. A Dinner for Workshop participants took place at the nearby Rossmount Inn on the evening of 15 October.

On Friday, 17 October, the official commemoration of the 100th Anniversary took place at the Biological Station. Keynote speakers included: DFO's RDG Faith Scattolon; Fred Whorisky representing the Huntsman Marine Science Centre and the Atlantic Salmon Centre; John Craig, Mayor of St. Andrews; Rick Doucet, New Brunswick Minister of Fisheries and Aquaculture; and Charlotte County MP Greg Thompson, Minister of Veterans Affairs. A plaque marking the occasion was unveiled. Coincidentally, the construction on the new main Building at the St. Andrews Biological Station has just started. The Town of St. Andrews hosted an informal dinner Friday evening.

The 100th SABS Anniversary celebration had something for everyone. It was most enjoyable to see past researchers and technical staff, current staff members and their families, scientists from universities and research centres, representatives from industry, etc., reminiscing on events of the past and discussing current issues affecting fisheries and the marine environment.

IN MEMORIAM

Jules Aerts, on 15 August 2008, aged 92. Following a career as an Electronics instructor at The Nova Scotia Institute of Technology, Jules worked at the Bedford Institute of Oceanography in the 1980s as technician.

George Donald Anderson, on 27 October 2008, aged 66. George worked for 38 years at BIO, beginning as a steward and later quartermaster on CSS *Baffin* until he transferred ashore in 1996 to take a position in the Shipping and Receiving section. Music was Newfie George's hobby for which he was widely known in the community. George volunteered his many talents to plan and carry out functions and social occasions at BIO throughout his working career and into his retirement.

William Maxwell Cameron, on 4 July 2008, aged 93. Dr. Cameron played a leading role in the establishment of the Bedford Institute of Oceanography and the Institute of Ocean Sciences during the 1950s and 1960s.

Jim Hynds, on 18 July 2008, aged 72. Jim served as Chief Electrical Officer aboard CSS *Hudson* for 18 years, retiring in 1996.

Stephen Roy Kerr, on 27 September 2008, aged 69. (See page 4 for additional information.)

Jean-Paul "John" Powroz, on 3 October 2008, aged 77. Following a career with the Canadian Navy, John served as Chief Electrical Officer aboard CSS *Dawson* for 14 years, retiring in 1985.

BIO COMMEMORATIVE STAMP PROJECT:
KEY EVENTS IN BIO'S 50-YEAR HISTORY

Compiled by Dale Buckley

As part of the effort to prepare a proposal to have a Canadian Postage Stamp issued to commemorate the 50th anniversary in 2012 of the founding of BIO, a history of the Institute has been assembled in outline form. It has two parts: one identifies significant events that had an impact or influence on projects and programs over the years, and the second identifies significant scientific accomplishments or achievements obtained. It is essential that both outlines be as brief as possible, allowing only point form statements that are clear and concise. These events or accomplishments are identified by the year in which they occurred. Scientific accomplishments usually take more than one year, and this will be indicated where possible.

Historical Events

1961

Construction of the first BIO buildings begins.

1962

First building opened in July with 45 staff. Official opening of BIO on 25 October, with 112 staff.

1963

First field projects originating from BIO commence. Marine Geology / Marine Geophysics established at BIO.

1964

CSS *Hudson* commissioned. First female geologist/ oceanographer Kate Kranck, hired at BIO. Pan American Petroleum drilled 30 shallow wells on Grand Banks.

1965

Marine Ecology Laboratory established at BIO. Installation of CDC 3100 computer as mainframe computer for institute. Conceptual proposal for a causeway link between N.B. and P.E.I.

1966

First hydrocarbon exploration well drilled on Grand Banks. Metric units used for the first time in field reports.

1967

First hydrocarbon exploration well drilled on Scotian Shelf. Extension to administrative and laboratory wing of BIO constructed.

1968

CSS *Dawson* Commissioned. Establishment of Atlantic Oceanographic Lab. BIO ships begin using transit satellite systems for navigation. *Navicula* built for use by MEL.

1969

Beginning of HUDSON '70 Expedition around the Americas. Most southerly excursion of Canadian Oceanographic ship (CSS *Hudson*) in Antarctic waters. CSS *Acadia* retired. Deep Sea Drilling project begins based at Scripps Institution of Oceanography. Extensions to BIO Lab wing, depot, Fish Lab, and resources administration. Tanker *Manhattan* voyage through the Northwest Passage. CSS *Baffin* circumnavigates North America and travels through the Northwest Passage.

1970

CSS *Hudson* returns to BIO through the Northwest Passage; first ship to circumnavigate both North and South America. *Arrow* oil spill in Chedabucto Bay, 2.5 million gallons.

1971

Establishment of Environment Canada BIO. CSS *Kapuskasing* retired to Department of National Defence. Transfer of GSC Basin Analysis Group to BIO from Calgary. First hydrocarbon exploration well drilled on Labrador Shelf.

1972

Microbiology Laboratory for Environment Canada established. Establishment of Atlantic Geoscience Centre – Regional Reconnaissance, Eastern Petroleum Geology, Marine Geology. PDP –11 computer installed on CSS *Hudson*, mainly for navigation. Satellite navigation (transient) systems become standard on BIO ships.

1973

CHS Navigation Group only one in Canada specializing in marine navigation.

1974

Women employed on BIO ships crew for the first time. Discovery of gas in sediments on the Labrador Shelf. End of oceanographic and atmospheric observations from Ocean Ship Bravo in the Labrador Sea.

1975

Institute staff participate in Deep Sea Drilling Project.

1976

BIO Library designated as the major Canadian Oceanographic Library. Canadian Wildlife Service (CWS) Seabird Research Unit established at BIO. First hydrocarbon potential assessment completed for Scotian Shelf, Grand Banks, and Labrador Shelf.

1977

Extension of Canadian fisheries jurisdiction to 200 miles (320 km). Marine Fish Division moved to BIO. *Lady Hammond* moved to BIO.

1978

Resource Management and Conservation Branch, Department of Energy Mines and Resources, responsible for coal drilling off Cape Breton. Department of Fisheries and Oceans established. *Amoco Cadiz* tanker breaks up on coast of France, spilling 220,000 t of oil.

1979

Beginning of China/Canada cooperation in oceanography. Cyber 171 becomes new main computer for the Institute. Hibernia oil discovery on Grand Banks of Newfoundland. *Kurdistan* oil tanker breaks up and spills oil in Cabot Strait. Northwest Atlantic Fisheries Organization (NAFO) established.

1980

Ocean Bottom Seismometers first become operational. First Huntsman awards made at BIO.

1981

With 801 scientific, technical, and administrative staff, BIO becomes the largest multidisciplinary integrated oceanographic and hydrographic institute in the world. CSS *Hudson* circumnavigates North America on nine-month expedition.

1982

OCEAN RANGER drilling rig sinks on the Grand Banks. Point Lepreau nuclear power station begins operation.

1983

CESAR ice camp established over Alpha Ridge in Arctic Ocean.

1984

George's Bank Canada/USA boundary dispute settled by International Court of Justice; northeast portion of bank awarded to Canada.

1985

The wreck of the *Titanic* is found off the Tail of the Grand Banks by French and American oceanographers.

1986

F.C.G. *Smith*, a sweep vessel, is commissioned. Chernobyl nuclear accident, 16 May.

1987

Development of initial electronic navigational (hydrographic) charts. Ban on hydrocarbon exploration wells on Georges Bank for 12 years.

1988

Labrador Sea basin atlas published.

1989

Publication of circumpolar geology map of the Arctic Ocean, jointly with Soviet Union.

1990

The final report of the Fournier Task Force on Halifax Harbour is issued.

1991

CSS *Baffin* and CSS *Dawson* retired, replaced by CSS *Matthew* and *Parizeau*.

1992

Cohasset – Panuke – Belmoral hydrocarbon development begins production.

1993

Atlantic Geoscience Centre receives one billion dollars worth of geological and geophysical data from Husky Oil and Petro Canada. Development of electronic navigation charts for Canadian ships and ports.

1994

CCGS *Louis St. Laurent* is the first Canadian ship to reach the North Pole.

1995

Ultra high resolution acoustic soundings are obtained in field operations.

1996

Canada Oceans Act – jurisdiction and rights defined.

1997

First oil well on Grand Banks, Hibernia, begins production. Ocean Act for protection of oceans passed.

1998

Map of Coastal Sensitivity published.

1999

Ocean Colour Facility (from satellites) established.

2000

CHS becomes world leader in developing electronic hydrographic charts. Sea Map office established at BIO. Centre for Marine Biodiversity established at BIO.

2001

CHS completes electronic charts for all major harbours and routes on the east Coast of Canada.

2002

Phytoplankton database at BIO most extensive and consistent.

2003

UN Convention on the Law of the Sea (UNCLOS) ratified by Canada.

2004

The Gully declared a Marine Protected Area.

2005

UNCLOS Management Board Office established at BIO.

2006

Species at Risk Office maintained at BIO.

2007

Level II building housing laboratories and offices at BIO opened.

BIO COMMEMORATIVE STAMP PROJECT:
SCIENTIFIC ACCOMPLISHMENTS OF THE BEDFORD INSTITUTE OF OCEANOGRAPHY

Compiled by Dale Buckley

1962

Polar Continental Shelf Project, initiated in 1959, continues geological mapping and oceanographic observations for next 12 years.

1963

Eastern Arctic oceanographic studies carried out by CSS *Labrador* and CSS *Baffin*. CSS *Labrador* reaches 81.3 degrees north in Kane Basin.

Geological mapping of surficial sediments in Hudson Bay begun in 1961 continues, with addition of shallow depth acoustic profiles of sediments.

Marine geological and geochemical studies of Gulf of St. Lawrence carried out by Fisheries Research Board. Studies carried out over five years.

1964

Beginning of surficial geological mapping of Nova Scotia Continental Shelf using acoustic sounding records and bottom grab samples. Maps produced from this project (first published in 1970) are the first of this type published anywhere in the world.

Discovery of Orpheus Gravity Anomaly in Chedabucto Bay, possible unusual sediment wedge.

Identification of area of Gulf Stream decay in mid-Atlantic.

First multidisciplinary cruise on *Baffin:* hydrography and geophysics carried out in Bay of Fundy.

Major oceanographic study carried out in Gulf of St. Lawrence and Saguanay Fjord defines water stratification and mixing zones.

1965

First Mid-Atlantic Ridge Survey using *Hudson* designed to determine the nature and origin of this major mid ocean ridge. Expeditions were carried out until 1969 and determined that the ridge was a spreading center with new oceanic crust being injected into the seafloor by a series of volcanic dikes along the valley.

First detailed physical oceanographic studies of Baffin Bay and Labrador Sea.

Marine geology program emphasizes Arctic studies in Baffin Bay, Arctic Archipelago and Prince Gustaf Adolf Sea.

Tidal survey in Bay of Fundy carried out for possible tidal power development.

1966

First major oceanographic expedition in Labrador Sea identifies low salinity Cold Labrador Sea Water that is key to the development of the "global conveyor belt" of ocean circulation and atmospheric interaction.

Fisheries Research Board (FRB) develops system study in St. Margaret's Bay to determine biological productivity.

Dredged siltstone from The Gully determined to contain significant concentration of hydrocarbons. Sediment later determined to be Lower Cretaceous age.

1967

Marine Geological studies carried out off Caribbean Islands.

1968

Initial development of Batfish, a towed porpoising instrument capable of profiling the upper few hundred meters of the ocean demonstrates great potential. Eventually, this instrument manufactured by private industry will carry up to six sensors.

Rock core drill powered by hydrostatic pressure, developed over past two years successfully tested on seamounts in North Atlantic.

Geophysical survey of Grand Banks finds gravity anomaly indicative of favorable structure for hydrocarbon accumulation.

Physical Oceanographic studies in Strait of Canso begin three-year research on effect of Canso Causeway.

1969

First Canadian published hydrographic chart of Grand Banks of Newfoundland.

First deep (5000m) measurement of currents across Gulf Stream in North Atlantic.

Marine Ecology Laboratory demonstrates that kelp is most important plant sustaining nearshore productivity.

1970

Discovery that Explorer Trench off British Columbia is zone of rifting.

Discovery of numerous pingoes in Beaufort Sea and Arctic inter-island areas.

Research establishes the significant wave height for Northwest Atlantic, with 100 year wave reaching 16 to 30 m; highest in northeastern Atlantic.

Oil from sunken tanker *Arrow* traced as far as Halifax. By 1976 there was undetectable oil in the water, but some persistent oil on rocky shorelines.

Flemish Cap confirmed as continental as result of *Glomar Challenger* drilling.

Intensive study of foraminifera found in sediment cores from Arctic and Atlantic greatly enhances understanding of ecology of these microscopic indicator organisms.

The biological impact of oil in seawater as determined from *Arrow* oil spill appears to have been minimal.

1971

Petroleum residue from sunken barge *Irving Whale* at a high level in the central Gulf of St. Lawrence and Cabot Strait.

Cooperative research in aquaculture for oysters, mussels, moss and salmon establishes viability of the aquaculture industry.

Geophysical studies in Baffin Bay determine that the Bay has an oceanic origin.

A four-year multidisciplinary study of the Gulf of St. Lawrence begins, demonstrates significant correlation of fisheries production in Gulf with flow of St. Lawrence River (1972), and documents that fresh water inflow to Gulf has been reduced by 1/3 to 1/2 over past 20 years (1973), St. Lawrence estuary has maximum chemical flux in turbidity maximum zone (1975).

Beaufort Sea Atlas of Coastal and Marine Geology begun, with final compendium published in 1985.

1972

International study of the Gulf Stream in the North Atlantic includes Great Britain, United States, France, Russia and Germany over next 10 years.

Labrador Sea Project begins, emphasizing geology and geophysics of shelf and deep sea areas.

1973

Discovery of severe contamination of Saguenay fjord sediments by mercury derived from the 112 tonnes discharged from the paper manufacturing industry over the

time of operations.
Canso Strait environmental study examined indicators of impact of Canso Causeway and contamination by industries established along the strait south east of the causeway. Severe sediment contamination by waste from the pulp and paper plant and the adjacent oil refinery and heavy water plant was found.
Bay of Fundy sediment dynamics study begins in relation to potential tidal power development. Studies of the Fundy system eventually expand to include satellite remote sensing of suspended sediments (1974), ecological dynamics (1977), assessing potential changes in tidal dynamics (1978), innovative techniques for sediment dynamics including Landsat Satellite, tethered camera on balloon, and radioactive tracer beads (1978).
Deep ocean circulation studies emphasize flow exchange between Arctic and Atlantic Ocean, "Overflow 73" through the deep Denmark Strait.

1974

Biostratigraphic zonation determined from examination of fossil samples from 60 drilled wells covers 2.5 million square kilometers.

1975

Oil contamination in the form of floating particulates virtually nonexistent north of Gulf Stream, oil contamination of benthic organisms leads to minimum mortality.
Miramichi Estuary environmental three-year study begins including seasonal observations of flushing characteristics, contaminant transport and sediment dynamics.
Environment Canada begins comprehensive study of contaminants in sediments and uptake in fish.

1976

Intensive studies of phytoplankton and zooplankton finds patchy distribution in the Gulf of St Lawrence and on Scotian Shelf, however, estimates of fish productivity can be made from the concentration of phytoplankton.
Labrador Sea studies with two-year field program by physical and chemical oceanographers find vertical stability and instability with conditions suitable for development of numerical models for deep convection. Related air/sea interaction analyses also find instability but significant exchange of CO_2 with the surface waters.
CWS (Environment Canada) establishes a Seabird Research Unit at BIO to formally integrate marine ornithology with the other ocean sciences.

1977

Saguenay Fjord study finds sediment accumulation rate at 8 cm/a near the head of the fjord and 0.2 cm/a at the junction with the St Lawrence estuary.
Gulf Stream long term moored array begins (1977 – 1979). Current studies along Scotian Shelf break demonstrate interaction with Gulf Stream.
Peruvian fisheries study carried out from CSS *Baffin* under CIDA direction designed to improve knowledge of anchoveta.
Labrador geophysical study (seismic refraction) defined opening of the Labrador Sea 85 million years ago.
Estimates of Harp Seal populations indicate significant growth in past few years.

1978

Organic geochemistry of drilled well samples from the Scotian Shelf indicates that the sediments are too immature to produce oil.
Long-term studies of hydrocarbon residues in clams indicate persistent retention although non-lethal effects.
Statistical analyses of fresh water run off and the lobster catch in the Gulf of St. Lawrence shows positive correlation.
Relict iceberg scours on Scotian Shelf found to be 19 to 20 thousand years old.
Reproductive failure of high-arctic breeding seabirds recorded by BIO scientists.

1979

Beginning of Nuclear Energy Agency program to determine the feasibility of disposing of high-level nuclear waste into the seabed. This Seabed Project, lead by scientists from AGC lasted 7 years and involved surveys and sampling in the western and eastern North Atlantic as well as the eastern North Pacific.
Current measurements over Flemish Cap found an anticyclonic gyre.
Marine Chemistry established a relationship between atmospheric CO_2 and inorganic carbon in the sea. They also established that the total increase in inorganic carbon since industrialization was about 1%.
Two temporary field ice camps were established on the Arctic Ocean; LOREX the Canadian camp was established over the Lomonosof Ridge and FRAM I (USA) was established over the Nansen and Gakkel Ridge. Canadian Scientists made oceanographic and geophysical observations to within 35 km of the North Pole.

1980

First major biological oceanographic expedition in Arctic Archipelago. CSS *Hudson* and CSS *Baffin* spend combined 8 months on hydrographic and oceanographic research in Arctic, with CSS *Hudson* reaching 80 degrees North. Assessment of hydrocarbon potential for Labrador Sea and Baffin Island Shelf determines that Tertiary or younger rocks under Labrador Shelf are too young to produce much oil and gas and no significant commercial accumulation of hydrocarbons occurs under the Baffin Shelf.

1981

Scientific visits by BIO scientists to China begin. Some scientists carry out extensive lectures at a number of scientific and oceanographic centers (1981, 1982). Some BIO scientists lead research teams in undertaking studies in China (1983 – 1985, 1987 – 1989) and some act as scientific consultants on major Chinese projects (1992). A BIO scientist visiting China in 1982 wrote a textbook on environmental marine geology. This book was translated into Chinese and published in China.
Ice scour and hazard analyses were carried out on the Labrador and Grand Banks where some scours were found to be 17 m deep.
A BIOSTAT cruise off Central America finds that photosynthetic bacteria accounted for 50% of the organic carbon. In 1982 it was suggested that these bacteria are very significant to overall productivity and may have implications for air/sea interaction by sequestering CO_2.

1982

Biological studies in the Bay of Fundy indicate much higher productivity than anticipated.
Results of ODP drilling, with BIO-scientist participation, indicate that the Atlantic Ocean began opening 200 to 140 million years ago.
Atlantic Geoscience Centre scientists develop a model for depicting thermal history and maturation of hydrocarbons in off shore exploration wells.
Fluorescence analyses of well samples from Hibernia show oil generation below 3800 m depth.
Studies of the oceanography in the west-

ern trough of the Atlantic near Greenland in the Labrador Sea show deep convection.

1983

Discovery of significance of picoplankton in productivity of oceans; most numerous organisms in oceans.

Labrador Current multiple year study begins. Interactions with the Gulf Stream cause sea surface anomalies. Run off from Hudson Bay causes increased productivity in Labrador Sea.

Seabed project investigates Southern Nares Abyssal Plain after two-year study of Southern Sohm Abyssal Plain. Both abyssal plains subject to sedimentation from distal turbidites.

1984

Investigations focus on questions of relationship between CO_2 and primary production, also on sequestering of CO_2 in deep convection.

1985

Seabirds on Grand Banks of Newfoundland consume 250,000 t of capelin, about the same amount as consumed by whales and harp seals.

Final expedition (with the participation of French, Dutch, American and British scientists) to potential nuclear waste disposal sites in North Atlantic to obtain long (30m) piston cores of abyssal plain sediments.

Coastal shoreline stability studies in Eastern and Arctic Canada indicate accelerating deterioration of many types of shorelines due to more open water in winter and to rising sea level.

1986

Pigmented picoplankton are found to be responsible for more than 50% of primary production in the ocean.

Radioactive fallout from the Chernobyl nuclear accident reaches Atlantic Canada,

1987

Shellfish poisoning on P.E.I. is attributed to demoic acid.

1988

Study of Halifax Harbour begins. Mapping of surface sediment types carried out using multichannel sweep vessel FCG Smith (1989 – 1992), metal contaminants and bulk organic contaminants determined from grab and core samples (1989 – 1992). Harbour sediments found to be most highly contaminated in eastern Canada.

Global atmospheric contaminants including PCBs and PAHs determined from samples collected on the Arctic ice island off the Queen Elizabeth Islands.

1989

Joint Global Ocean Flux Study begins to measure biological uptake of CO_2.

Completed studies on feasibility of disposal of high-level nuclear waste into the seabed with the decision that the concept is not feasible because of risk associated with faulting in sediments and pore water migration along fault planes.

1990

World Ocean Circulation Experiment begins gathering information in the Labrador Sea as part of a 7-year study to examine major current and circulation patterns such as the global conveyor belt.

1991

Basin Analysis Group in AGC is attempting to provide improved identification of hydrocarbon potential in the Canadian offshore.

Russian ship *Academia Keldish* with Canadian scientist on board retrieves artifacts from the wreck of the *Titanic*. Metal artifacts and part of a hull plate were analyzed at BIO to determine mechanism of corrosion; found to be bacterially assisted corrosion.

1992

World Ocean Circulation Experiment (WOCE) finds Labrador Sea Water cooling by 0.8 degrees since 1960.

Radioactivity survey in Barents Sea identifies waste from Soviet dumps and plants.

Radioactivity measured over sites of Soviet nuclear weapons tests surprisingly low.

1993

Coastal mapping project to depict sensitivity to erosion, begun in Newfoundland, extended to other Atlantic provinces and the west coast.

1994

Progress in research on phycotoxins (e.g., demoic acid) may provide a means of protecting the scallop industry; the largest fishery in Atlantic Canada.

Research has demonstrated that colloidal carbon is one of the largest pools of organic carbon in the ocean.

1995

Rapid progress in multibeam acoustic scanning for fish stock assessment.

Beginning of three-year study on impact of otter trawling on Grand Banks.

1996

WOCE studies in Labrador Sea indicate that this area may be a major sink for anthropogenic CO_2, sequestering 40% of the total world inventory.

Bacteria recognized as sometimes being a higher biomass than phytoplankton.

1997

Map of coastal sensitivity for Canada published.

1998

Observation of Labrador Current Water on eastern Canada slope causes temporary colder water on Nova Scotia shelf in 1998.

1999

New exotic species of phytoplankton found on Scotian Shelf.

Mapping of scallop habitat increases fishing success by factors of 2 to 4.

2000

Phytoplankton data set maintained at BIO is most extensive and consistent.

Measurements of isotopic iodine (129 I) found an increased discharge into Greenland

Sea by 600% from 1991 to 1997. This isotope is excellent tracer for ocean currents (water masses) and shows 250 % increase from European nuclear fuel reprocessing plants.

2001

Atlantic Seal Research Program to determine impact on cod.

Surveys of coral habitat show corals are found mainly at shelf break off Canadian east coast.

New model of salt diaperic dynamics provides improved prediction of hydrocarbon trapping.

Remote sensing using RADARSAT being employed for coastal studies in Arctic.

2002

Hydrocarbon potential of Carson Basin is demonstrated using computer model.

2003

Labrador Sea Water found to hold a great quantity of sequestered atmospheric CO_2.

2004

Geohazard surveys conducted in Beaufort Sea since 2002 completed.

2005

Masquash Estuary in New Brunswick designated Marine Protected Area.

Sunshine Bathes Our 2008 Picnic by Lake Charles

Betty Sutherland

What do you do to ensure a beautiful sunny day in the midst of two weeks of rain? Easy! Schedule the BIO-OA's summer picnic/barbecue at Shiri Srivastava's home that day! That's exactly what happened on Thursday 4 September. After days of sog and the prediction of several more days to come, the sun broke forth that morning. As a result, over 40 members and guests attended this year's barbecue and enjoyed good company and great food, including Shiri's tandoori chicken and Iris Hardy's chutney recipe (see below). Again this year, Gordon Fader provided the musical entertainment. It was particularly nice to see Willem van der Linden (formerly of AGC) and his wife Anne there. They had timed their trip to Canada from their home in The Netherlands especially to ensure that they could be at the barbecue to see many old friends.

Recipe for Branston Chutney

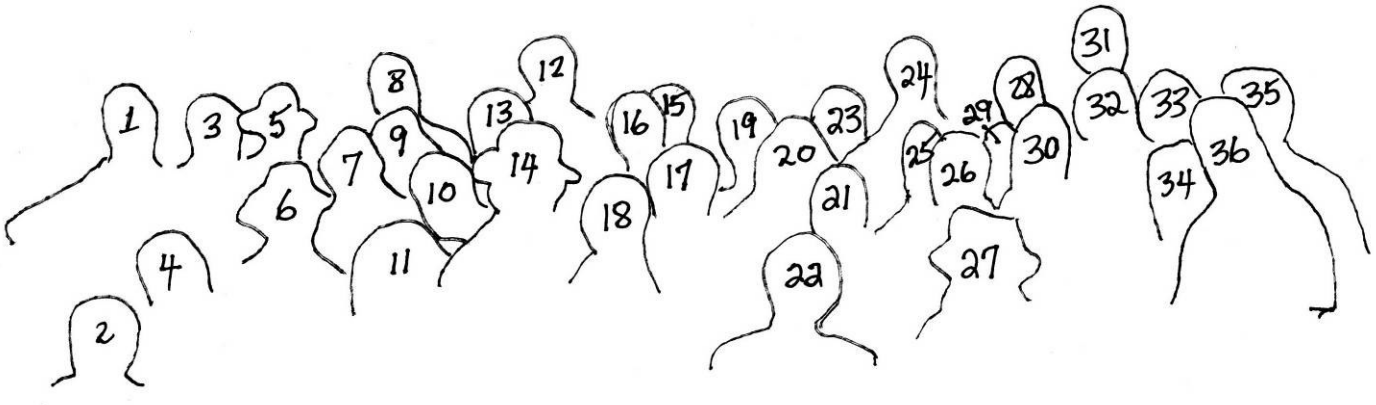
Chutney is a pungent relish of Indian origin made of fruits, spices, and herbs. The recipe below is a particular favourite in Britain that goes well very well with a Ploughman's Lunch of bread and cheese. When I discovered a tried and true recipe for this chutney, I immediately made it, with great results, which I was happy to share at our 2008 picnic. This recipe yields a rich and tangy, dark brown, somewhat chunky chutney that also goes well with sausages, mash, or cold meats. Enjoy!

2 lbs carrots (4 cups)
2 lbs vegetable marrow (overgrown zucchini - 4 cups)
2 lbs apples and or pears (I used apples)
2 lbs onions (4 cups)
8 cups cider vinegar (I used apple)
4 lbs plums, pitted and chopped (I used purple)
2 lbs dates, chopped
4 cloves garlic
2 lbs brown sugar
1 cup molasses
2 tsp ground ginger
1 tsp ground allspice
1 tsp chili powder (I didn't add this item)
1/2 tsp ground cloves
2 tsp salt

Method:
Chop the carrots, vegetable marrow, apples and/or pears, and onions into 1/2 " cubes. Put the cubes into a pan with the vinegar, and boil the mixture until the carrots are soft. Add the plums, garlic, and dates and cook for 10 minutes more. Next, add the sugar, molasses, salt, and spices and cook the mixture until it is thick. Pour the chutney into jars and seal them while the chutney is still hot.

— Iris Hardy

Key to photograph on page 11:



1. Bosko Loncarevic
2. Shiri Srivastava
3. Doug Loring
4. Georgina Phillips
5. Ted Phillips
6. Heather Cook
7. Jackie Dale
8. Dale Buckley
9. Bob Cook
10. Chris Corkette
11. Elisabeth Crux
12. David Sutherland
13. Michael Latrémouille
14. Sue Loring
15. Betty Buckley
16. Betty Sutherland
17. Anne van der Linden
18. Gillian Elliott
19. Marlene Karg
20. Mary Macnab
21. Sally King
22. Patricia Pocklington
23. Carol Loncarevic
24. Gordon Fader
25. Pat Rowell
26. Iris Hardy
27. Charles Quon
28. Carl Cunningham
29. Edna Cunningham
30. Jim Elliott
31. Ron Macnab
32. Terry Rowell
33. Bob Miller
34. Doreen Campbell
35. Doug Gregory
36. Willem van der Linden

UPCOMING BIO LECTURES OF INTEREST TO MEMBERS

HISTORY OF BIO

An illustrated talk by Dale Buckley, 26 November 2008, 2:30 – 4:00 p.m., BIO Main Auditorium

Scientific accomplishments of research scientists, engineers and technicians since the opening of the Bedford Institute of Oceanography in 1962 are amongst the most significant contributions made to oceanography anywhere in the World. The staff that carried out this research included many who came from more than 40 different countries. Research was conducted in every ocean to determine basic physical processes of circulation, geological evolution and potential resources, biological productivity, and the chemical nature of water and sediments. Over 46 years the research programs at BIO have evolved from determination of the nature of the oceans to programs designed to measure dynamic change and the impact of human activity on the oceans. BIO became the largest multidisciplinary oceanographic institute in the world in the 1980's, with ambitious projects being conducted in the middle of the Arctic Ocean and in the deep Atlantic and Pacific Oceans. Innovative technological developments allowed robotic instruments to function in ways that reduced time required to obtain huge amounts of data or to obtain samples from a wide variety of environments. Oceanographic ships in the BIO fleet were equipped with the most sophisticated navigational devices and the ships crews became experts in accurate navigation. Progress in developing oceanography in Canada through the programs at BIO is illustrated by photographs and technical illustrations drawn from the archives and technical reports.

THE ROLE OF THE OCEAN IN CLIMATE CHANGE; PAST AND PRESENT

2008 Huntsman Award and Lecture, 27 November 2008, 2 p.m., BIO Main Auditorium

The recipient of this year's Huntsman Award is Dr. Roger François of the Department of Earth and Ocean Sciences at the University of British Columbia.

Dr. Roger François has conducted ground-breaking research in marine geochemistry. He holds a Canada Research Chair in the

Department of Earth and Ocean Sciences, University of British Columbia. Dr. François obtained his PhD from the University of British Columbia in 1987 and spent the subsequent 15 years of his career at the Department of Marine Chemistry and Geochemistry at the Woods Hole Oceanographic Institution, where he is still an adjunct research scientist. He has been actively involved in large international programs with a biogeochemical focus, such as JGOFS and GEOTRACES.

Dr. François' research is centred at the intersection of physical, chemical, and biological processes and has influenced our understanding of climate-related changes in ocean circulation and ocean chemistry. His research has focused partly on the global carbon, nitrogen and silica cycles (past and present), and more recently on the global biogeochemical cycling of metals. He has been particularly innovative in applying novel techniques to address processes that have occurred in the past million years. Specifically, Dr. François has developed the use of light stable isotopes for understanding algal production and nutrient cycling in the ocean, and for determining past changes in water column stratification. Additionally, he has developed tracers that have paved the way for the reconstruction of past ocean circulation and its impact on global climate and his innovative techniques for measuring sedimentation processes are being used to explore the history of sediment burial. Dr. François is internationally renowned for his deeply insightful research in marine biogeochemistry, his innovative skill in data acquisition and analysis, and his interpretation of the complex behaviour of the ocean–atmosphere system over long-term climatic timescales.

ABOUT THE ASSOCIATION

The Bedford Institute of Oceanography Oceans Association was established in 1998 to foster the continued fellowship of its members; to help preserve, in cooperation with the Institute's managers and staff, BIO's history and spirit; and to support efforts to increase public understanding of the oceans and ocean science. Membership is open to all those who share our objectives. Most current members are present or past employees of BIO or of the federal departments of Environment, Fisheries and Oceans, and Natural Resources (or their predecessors) located in the Halifax Regional Municipality. Membership is $10.00 per year, $40.00 per half decade, or $150.00 for a lifetime membership.

OFFICERS AND DIRECTORS

PRESIDENT	Bob O'Boyle	835-6065(h) 446-1301(o)	bcubed@accesswave.ca
VICE-PRESIDENT	Don Gordon	469-3278(h) 426-3278(o)	gordond@mar.dfo-mpo.gc.ca
VICE-PRESIDENT	Charles Schafer	861-3145	charlestschafer@hotmail.com
PAST PRESIDENT	Betty Sutherland	454-6557	jesuther@dal.ca
SECRETARY	Iris Hardy	861-4797	bob.iris@ns.sympatico.ca
VICE SECRETARY	David McKeown	477-5887	davidmckeown@hfx.eastlink.ca
TREASURER	Bob Reiniger	477-9833	rreiniger@hfx.eastlink.ca
DIRECTORS AT LARGE:	Bob Cook	868-2948	bobheather@eastlink.ca
	Gordon Fader	455-6100	gordon.fader@ns.sympatico.ca
	Mike Hughes	860-0784	hughes@accesswave.ca
	Timothy Lambert	426-3872	lambertt@mar.dfo-mpo.gc.ca
	Carol Manchester	861-3509	k.manchester@ns.sympatico.ca
	Georgina Phillips	823-3401	tandgphillips@eastlink.ca

COMMUNICATIONS: NEWSLETTER, PR, AND WEB SITE

NEWSLETTER EDITOR	Michael Latrémouille	434-4036	latremouille@accesswave.ca
ASSOCIATE EDITOR	David Nettleship	826-2360	dnnlundy@navnet.net
PR AND MEMBERSHIP	Clive Mason	426-4163	masoncs@mar.dfo-mpo.gc.ca
WEBMASTER	Bosko Loncarevic	468-3392	infocd@cd-books.com

COMMITTEES/ WORKING GROUPS: CHAIRS

BELUGA AWARD	René Lavoie	826-2175	rene.lavoie@ns.sympatico.ca
BIO COMMEMORATIVE STAMP	Dale Buckley	434-5734	dbuckley@ns.sympatico.ca
EQUIPMENT ARCHIVES	David McKeown	477-5887	davidmckeown@hfx.eastlink.ca
GRAPHIC DESIGN	Art Cosgrove	443-7945	acosgrove@hfx.eastlink.ca
HMCS SACKVILLE HISTORY	Keith Manchester (contact)	861-3509	k.manchester@ns.sympatico.ca
LIBRARY ARCHIVES	Bosko Loncarevic	468-3392	infocd@cd-books.com
PHOTO ARCHIVES	Michael Latrémouille	434-4036	latremouille@accesswave.ca
SOCIAL PROGRAMS	Gordon Fader	455-6100	gordon.fader@ns.sympatico.ca

Newsletter printed by Jean and Michael Crowell, The UPS Store, Tantallon, Nova Scotia, (902) 826-7087.